SECTION 702
FLY ASH AND GROUND GRANULATED BLAST FURNACE SLAG

Description. This section covers fly ash to be used to modify or stabilize soils and ground granulated blast furnace slag and fly ash to be used as an admixture for concrete.

702.01. FLY ASH.

Fly ash shall meet the requirements of ASTM C 618, Class C or Class F.

The product of only one plant shall be used on the project, unless otherwise approved by the Engineer. The Contractor shall provide suitable means of storing and protecting the fly ash against contamination and dampness. Fly ash which has become partially set, contains lumps of caked fly ash, or has been contaminated will be rejected.

All methods of sampling and testing shall be in accordance with the above requirements except as modified by the Department's acceptance policy published as: "Procedure for Sampling, Testing and Acceptance of Fly Ash." Copies of the procedure are available at the office of the Materials Engineer.

702.02. GROUND GRANULATED BLAST FURNACE SLAG.

Ground granulated blast furnace slag shall meet the requirements of AASHTO M302, Grade 100 or 120.

The product of only one plant shall be used on the project, unless otherwise approved by the Engineer. The Contractor shall provide suitable means of storing and protecting the ground granulated blast furnace slag against contamination and dampness. Ground granulated blast furnace slag which has become partially set, contains lumps of caked ground granulated blast furnace slag or has been contaiminated will be rejected. All methods of sampling and testing shall be in accordance with the above requirements except as modified by the Department's acceptance policy published as: "Procedure for Sampling, Testing and Acceptance of Ground Granulated Blast Furnace Slag." Copies of the procedure are available at the office of the Materials Engineer.

SECTION 703
MINERAL AGGREGATE, MISCELLANEOUS USES

Description. This Specification covers the requirements for mineral aggregate intended for various uses not specifically covered in other sections of these Specifications.

703.01. AGGREGATE FOR AGGREGATE BASE.

(a) **Materials Covered.** These Specifications cover the aggregate for use in the construction of aggregate base courses (Section 303).

(b) **General Requirements.** The aggregate base course material shall consist of an intimate mixture of graded aggregate, coarse and fine, and shall be practically free from vegetation or other deleterious substances. Coarse aggregate (material retained on a No. 10 (2.00 mm) sieve) shall consist of sound, tough, durable particles or fragments of gravel, stone, mine chats, disintegrated granite, crushed

concrete, or a combination thereof. Fine aggregate shall be sand, stone dust, or other inert, finely-divided mineral matter.

At least 40 percent of that portion of the completed mixture retained on the No. 4 (4.75 mm) sieve shall be composed of uniformly graded crushed particles (pieces of aggregate with one or more fractured faces resulting from the artificial crushing).

One hundred percent (100%) of the completed type C mixture retained on the No. 4 sieve shall be composed of uniformly graded particles with two or more fractured faces resulting from artificial crushing. The complete type C mixture may not contain more than fifteen percent (15%) natural (uncrushed) sand.

(c) **Physical Properties.** The coarse aggregate retained on the 3/8 inch (9.5 mm) sieve of the finished mixture shall have a percent of wear, Los Angeles Abrasion Test, of not more than 45. No source of material used in the blend shall have a percent of wear of more than 45. The aggregate shall have an aggregate durability index of 40 or more.

(d) **Gradation.** The graded aggregate, when uniformly blended and sampled from trucks or windrows, shall conform to the following requirements depending on the type being used. Materials for base courses which contain oversize particles of rock, gravel, lumps of clay, or conglomerated material shall not be loaded into vehicles for delivery to the road. Such oversize particles of aggregate must be screened, crushed, or otherwise processed to meet the Specifications before delivery to the road. The samples taken from trucks or windrows after the graded aggregate has been uniformly blended shall conform to the gradation limits for the type being constructed, as follows:

SIEVE SIZE	TYPE A	TYPE B	TYPE C
		PERCENT PASSING	
3 inch (75 mm)		100	
2 inch (50mm)			100
1 1/2 inch (37.5 mm)	100	40-100	90-100
1 inch (25.4mm)			80-100
3/4 inch (19.0 mm)	40-100	30-75	
1/2 inch (12.5mm)			60-80
3/8 inch (9.5 mm)	30-75	25-60	
No. 4 (4.75 mm)	25-60	20-50	40-60
No. 10 (2.0 mm)	20-43	15-35	25-45
No. 40 (425 µm)	8-26	7-22	15-30
No. 200(75 µm)[a]	4-12	3-10	0-5
Plasticity Index[b], %, maximum	6	6	6
Liquid Limit[b], %, maximum	25	25	25

[a] The material passing the No. 200 (75 µm) sieve shall not be greater than 2/3 of the amount of material passing the No.40 (425 µm) sieve.

[b] The blending of separate aggregates will be permitted to produce an aggregate mixture meeting these requirements providing no individual aggregate has a plasticity index in excess of 8.

(e) **Sampling and Testing.** Tests shall be conducted in accordance with the latest revision of the following AASHTO Methods except as noted:

Los Angeles Abrasion	T 96
Sieve Analysis	T 27
Sampling	T 2
Determining Plastic Limit & Plasticity Index	T 90
Fractured Faces	OHD L-18
Method of Preparation of Samples	T 87
Determining Liquid Limit	T 89
Standard Density	T 180 Method D
Aggregate Durability Index	T 210
Material Passing No.200 (75 µm) Sieve	T 11
Dust Coating (Plus No.8 (2.36 mm) material after dry sieving)	T 11
Soft Particles	OHD L-38

703.02. COVER AGGREGATES FOR BITUMINOUS SURFACE TREATMENTS.

(a) **Materials Covered.** This Section establishes the requirements for aggregate to be used in construction of bituminous surface treatment (Section 402).

(b) **General Requirements.** The aggregate for cover material shall consist of clean, sound and durable particles of mine chats, crushed gravel, or crushed stone. The cover material shall be of uniform quality throughout with not more than 5 percent of slate, shale, or soft stone particles and shall be substantially free from organic matter, clay, loam, or objectionable coating. A minimum of 75 percent of the aggregate retained on the No. 4 (4.75 mm) sieve shall have 2 or more mechanically fractured faces.

The cover aggregate shall be reasonably dry when placed on the bituminous binder except when cationic emulsified asphalt is used.

After the work starts, the same kind of cover material shall be used throughout the project unless otherwise permitted in writing by the Engineer.

(c) **Physical Properties.** The cover aggregate shall conform to the following requirements:

PROPERTY	LIMITS
Los Angeles Abrasion, % wear, maximum	40
Durability, Dc Factor, minimum	40
Flat or elongated pieces[a], %, maximum	15

[a] A flat and elongated piece is one in which the length is greater than 5 times the average thickness.

(d) **Gradation.** The gradation requirements for cover aggregates shall be as follows:

Sieve Size	No. 1 Aggregate	No. 2 Aggregate	No. 3 Aggregate	No. 3C Aggregate
		Percent Passing		
3/4 inch (19.0 mm)	100			
5/8 inch (16.0 mm)			100	100
1/2 inch (12.5 mm)	25-60	100	90-100	70-100
3/8 inch (9.5 mm)	0-15	90-100	40-75	20-55
No. 4 (4.75 mm)	0-5	0-25	0-15	0-15
No. 8 (2.36 mm)		0-5	0-5	0-5
No. 200 (75 µm)	0-2	0-2	0-2	0-2
Dust Coating[a]	0-1	0-1	0-1	0-1

[a] Dust coating on aggregates retained on No. 8 (2.36 mm) sieve shall be determined by ash loss (AASHTO T 11) after dry sieving.

The specific gradation or gradations shall be as shown on the Plans or in the Proposal. Use the same kind of specified aggregates throughout the project unless otherwise permitted in writing by the Engineer.

(e) **Precoated Cover Aggregates.** When precoated material is specified, treat cover aggregate meeting the above Specification requirements with bituminous material meeting the requirements of Subsection 708.03. The application of bituminous material is to be within the range of 0.30 to 1.75 percent by mass of the untreated aggregate, depending on the type and grade of bituminous material applied. Apply sufficient quantity to satisfy the particular needs of surface absorption, dust dissipation, and film coating--durable and free of scales and blisters-- of the aggregate to be treated. When applied to the road, it shall be free of excess binder or moisture which might hinder the handling, spreading, or rolling operations.

NOTE: The producer shall obtain the approval of the Materials Engineer pertaining to the type, grade, and amount of asphalt treatment prior to starting production.

The producer shall consistently ascertain that the aggregate is free of surface or absorbed moisture which will interfere with binder absorption and adhesion, or cause blisters or subsequent scaling of the treatment. However, when it is advisable or necessary to facilitate uniform coating of the aggregate with the bituminous material, water may be added at the pugmill in an amount not to exceed 2 percent by mass of the aggregate. When heating is required, or elected by the producer, he shall maintain the bituminous materials at temperatures below the flash points or damaging temperatures. The temperatures of asphalt materials shall be within the mixing range for the particular type and grade as shown in Subsection 708.03(c) during application of the asphalt material to the aggregate.

Flow characteristics of the treated aggregate shall be such that it may be satisfactorily spread by approved mechanical spreading devices.

The required percent of asphalt for precoating the aggregate shall be determined by inspection of the type and grade of bituminous material and aggregate used.

(f) **Sampling and Testing.** Sampling and testing shall be in accordance with the applicable methods of subsection 703.01(e).

703.03. AGGREGATES FOR TRAFFIC BOUND SURFACE COURSE.

(a) **Materials Covered.** This Subsection covers the requirements and test methods for aggregates to be used in the construction of traffic bound surface course in Section 403.

(b) **General Requirements.** Traffic bound surface course material shall consist of an intimate mixture of graded aggregate-- coarse and fine-- and shall be practically free from vegetation or other deleterious substances. Coarse aggregate, material retained on a No. 10 (2.00 mm) sieve, shall consist of sound, tough, durable particles or fragments of gravel, stone, mine chats, disintegrated granite, or combination thereof, crushed to size if necessary. Fine aggregate shall consist of sand, stone dust, or other inert finely divided mineral matter.

(c) **Physical Properties.** The coarse aggregate retained on the 3/8 inch (9.5 mm) sieve of the finished mixture for Types A, B, C, D, and E shall have a percent wear not more than 45 when tested in accordance with the Los Angeles Abrasion Test.

(d) **Gradation.** This Specification permits the selection and use of one of 6 gradations or types of surface course. The type required on the project may be specified in the bid item of the Proposal. When the type is not so specified, the Contractor may select the gradation or type in advance of construction. The material produced or processed shall conform in gradation for the type specified or selected. After work starts, the same type of material as specified or selected shall be used throughout the project unless otherwise permitted in writing by the Engineer.

Oversized particles of rock, gravel, lumps of clay, or conglomerate materials delivered to the road shall be crushed to meet the Specification sizes and shall then be incorporated in the surfacing material.

	TYPE A[a]	TYPE B[b]	TYPE C[c]	TYPE D[d]	TYPE E[e]	TYPE F[f]
SIEVE SIZE	PERCENT PASSING					
1 1/2 inch (37.5 mm)				100	100	100
1 inch (25.4 mm)	100	100	100	90-100		
3/4 inch (19.0 mm)	95-100	95-100			40-100	
1/2 inch (12.5 mm)				25-60		
3/8 inch (9.5 mm)					30-75	
No. 4 (4.75 mm)	5-75	0-85	40-75	0-5	25-60	35-80
No. 10 (2.5 mm)					20-43	
No. 20 (850 µm)	0-30					
No. 40 (425 µm)			20-40		8-26	
No. 200 (75 µm)	0-10	0-20	8-25		4-12	0-20
Plasticity Index, %			8-18		6 max.	
Liquid Limit, %, maximum			Not more than 35		25 max.	

[a] Type A material shall consist of hard durable particles of sand, gravel, mine chats, crushed rock, or a combination of any of these materials.

[b] Type B material shall consist of hard, durable particle of disintegrated granite with natural binder.

[c] Type C material shall produce a bonded traffic bound surface course and shall consist of an intimate mixture of graded aggregate, coarse and fine. Coarse aggregate (material retained on a No. 10 (2.00 mm) sieve shall consist of sound, tough, durable particles or fragments of gravel, stone, disintegrated granite, or combination thereof, crushed to size if necessary. Fine aggregate shall consist of sand, stone dust, or other inert finely divided mineral matter.

[d] Type D material shall consist of hard durable particles of gravel or crushed stone.

[e] Type E material shall meet the requirements for Aggregate Base Type A in Subsection 703.01.

[f] Type F material shall consist of crusher run ledge rock, gyp rock or caliche and shall be used for temporary purposes only, in light traffic situations. The Los Angeles Abrasion Test requirement is not applicable to this material.

(e) **Sampling and Testing.** Sampling and testing shall be in accordance with the applicable methods of Subsection 703.01(e).

703.04. COVER MATERIAL FOR PIPE UNDERDRAINS.

(a) **Materials Covered.** These Specifications cover the materials used for coarse cover aggregate and filter sand for use with underdrain pipes in Section 613.

(b) **General Requirements.** Coarse cover material shall be gravel or crushed stone. Filter sand shall be well graded and free from organic or other deleterious materials.

(c) **Physical Properties.** The coarse cover material shall have a maximum abrasion loss of 50 and a minimum aggregate durability index of 40.

(d) **Gradation.**

1. ***Coarse Cover Aggregate.***

Sieve Size	Percent Passing
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	90-100
No. 4 (4.75 mm)	20-55
No. 8 (2.36 mm)	0-25
No. 16 (1.18 mm)	0-5
No. 50 (300 µm)	0-2

2. ***Filter Sand.***

Sieve Size	Percent Passing
3/8 inch (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	50-85
No. 50 (300 µm)	15-33
No. 100 (150 µm)	0-10

(e) **Sampling and Testing.** Sampling and testing shall be in accordance with the applicable methods of Subsection 703.01(e).

703.05. GRANULAR BACKFILL.

(a) **Materials Covered.** These Specifications cover granular backfill for use in excavation for structures (Section 501).

(b) **General Requirements.** All granular backfill material shall be free from organic or other deleterious materials.

(c) **Physical Properties.** The granular backfill material shall be substantially free of shale or other soft, poor durability particles, and the granular backfill shall have an aggregate durability index greater than or equal to 30.

(d) **Gradation.** The granular backfill material shall be well graded and conform to the following gradation requirements.

Sieve Size	Percent Passing
3 inch (75 mm)	100
1 inch (25.0 mm)	90-100
No. 40 (425µm)	0-45
No. 200 (75µm)	0-10
Plasticity Index	Non-Plastic

(e) **Sampling and Testing.** Sampling and testing shall be in accordance with the applicable methods of Subsection 703.01(e).

703.06. STANDARD BEDDING MATERIAL.

(a) **Materials Covered.** These Specifications cover standard bedding material used in the construction of drainage conduits in Section 613.

(b) **General Requirements.** Standard bedding material shall be sand, stone, screenings, or select sandy soil, and it shall be free of the following: organic material, stones larger than 3 inches (76.2 mm) in greatest dimension, frozen lumps, or moisture in excess of that permitting the specified compaction.

(c) **Gradation.**

1. ***Class B Bedding Material.*** Class B bedding material shall conform to the following gradation requirements.

Sieve Size	Percent Passing
3/8 inch (9.5 mm)	100
No. 200 (75 µm)	0-10

2. ***Class C Bedding Material.*** Class C bedding material shall be 1 inch (25 mm) maximum size granular material meeting the requirements of AASHTO M145 A-1 or A-3.

(d) **Sampling and Testing.** Sampling and testing shall be in accordance with the applicable methods of Subsection 703.01(e).

SECTION 704
SOIL AGGREGATES

704.01. SOIL AGGREGATES FOR SUBBASES.

Description. These Specifications cover the material for use in the construction of a subbase foundation course in Section 306.

(a) **Materials.** Subbase material shall conform to the requirements listed herein for the type of material designated on the Plans or in the Proposal. Unless otherwise shown on the Plans, furnish soil aggregate for subbases, and make such preliminary investigations as may be necessary to locate the proposed source of acceptable material. Information obtained by the Department in its preliminary investigations will be available to prospective bidders at the Materials Laboratory. Subbase materials shall meet the specified requirements before incorporation in the work.

NOTE: No material shall be delivered to the roadbed when the plasticity index exceeds the specified requirements by more than 2 points.

Type I. Subbase material to be used in Type I work shall pass a 3 inch (75 mm) sieve. If any material hauled on the project does not reduce to 3 inch (75 mm) or less, remove it from the right-of-way limits.

The material passing the 3 inch (75 mm) sieve and retained on the No. 10 (2.00 mm) sieve shall be composed of sound, durable particles. Lumps or clods will be broken down for testing. Material produced from a rock or rocklike formation shall have a slake durability index of 80 or more.

The fraction passing the No.10 (2.00 mm) sieve shall conform to the following:

Sieve Size	Percent Passing
No. 200 (75 µm)	5 - 45
Liquid Limit, %, maximum	30
Plasticity Index, %, maximum	10

Type II. Subbase material to be used in Type II work shall be a soil aggregate obtained from an approved source. Material retained on the No.10 (2.00 mm) sieve shall be composed of sound, durable particles or fragments of sand, gravel, crushed stone, crushed concrete, mine chat, disintegrated granite,